CLAIMS

I/We claim:

[c1] 1. A set of microfeature workpieces, the set comprising:

a first microfeature workpiece including a plurality of first microelectronic dies, wherein individual first dies have a first integrated circuit, a plurality of first pads electrically coupled to the first integrated circuit, and a plurality of first conductive complementary structures on corresponding first pads; and

a second microfeature workpiece including a plurality of second microelectronic dies, wherein individual second dies have a second integrated circuit, a plurality of second pads electrically coupled to the second integrated circuit, and a plurality of second conductive complementary structures on or at least proximate to corresponding second pads, the second conductive complementary structures being configured to interface with the first conductive complementary structures.

[c2] 2. The set of microfeature workpieces of claim 1 wherein the first conductive complementary structures include an aperture configured to receive at least a portion of one of the second conductive complementary structures.

[c3] 3. The set of microfeature workpieces of claim 1 wherein the first conductive complementary structures have male configurations and the second conductive complementary structures have female configurations.

[c4] 4. The set of microfeature workpieces of claim 1 wherein the first complementary structures have a generally triangular, circular, or rectangular configuration.

[c5] 5. The set of microfeature workpieces of claim 1 wherein the first and second complementary structures comprise solder.

[c6] 6. The set of microfeature workpieces of claim 1 wherein:

the first microelectronic dies include a first side and a second side opposite the first side;

the first pads comprise a plurality of first bond-pads on and/or in the first side of the first microelectronic dies;

the first conductive complementary structures are coupled to corresponding first bond-pads on the first side of the first microelectronic dies;

the second microelectronic dies include a first side and a second side opposite the first side;

the second pads comprise a plurality of second bond-pads on and/or in the first side of the second microelectronic dies; and

the second conductive complementary structures are coupled to corresponding second bond-pads on the first side of the second microelectronic dies.

[c7] 7. The set of microfeature workpieces of claim 1 wherein:

the first microelectronic dies include a first side, a second side opposite the first side, a first bond-pad on and/or in the first side, and a conductive link extending from the first side to the second side;

the conductive links have a plurality of ends defining the first pads on the second side of the first microelectronic dies;

the first conductive complementary structures are coupled to the first pads on the second side of the first microelectronic dies;

the second microelectronic dies include a first side and a second side opposite the first side;

the second pads comprise a plurality of second bond-pads on and/or in the first side of the second microelectronic dies; and

the second conductive complementary structures are coupled to the second bond-pads on the first side of the second microelectronic dies.

[c8] 8. The set of microfeature workpieces of claim 1 wherein:

the first microelectronic dies include a third die;

the first pads include a third pad and a fourth pad adjacent to the third pad on the third die; and

the first conductive complementary structures on the third and fourth pads are spaced apart from each other by a distance of less than approximately 100 microns.

[c9] 9. A microfeature workpiece, comprising:

a plurality of first dies, wherein individual first dies have a first integrated circuit and a plurality of first pads electrically coupled to the first integrated circuit; and

a plurality of first conductive mating structures at least proximate to the first pads, the first conductive mating structures projecting away from the dies and being configured to interconnect with corresponding complementary second conductive mating structures on second dies which are to be mounted to corresponding first dies.

[c10] 10. The microfeature workpiece of claim 9 wherein the first conductive mating structures have generally circular configurations.

[c11] 11. The microfeature workpiece of claim 9 wherein the first conductive mating structures have generally triangular configurations.

[c12] 12. The microfeature workpiece of claim 9 wherein the first conductive mating structures have generally rectangular configurations.

[c13] 13. The microfeature workpiece of claim 9 wherein the first conductive mating structures include an aperture configured to receive at least a portion of one of the second conductive mating structures.

[c14] 14. The microfeature workpiece of claim 9 wherein the first conductive mating structures have male configurations.

[c15] 15. The microfeature workpiece of claim 9 wherein the first conductive mating structures have female configurations.

[c16] 16. The microfeature workpiece of claim 9 wherein the first conductive mating structures comprise solder.

[c17] 17. The microfeature workpiece of claim 9 wherein:

the first dies include a first side and a second side opposite the first side;

the first pads comprise a plurality of bond-pads on and/or in the first side of the first dies; and

the first conductive mating structures are coupled to the bond-pads on the first side of the first dies.

[c18] 18. The microfeature workpiece of claim 9 wherein:

the first dies include a first side, a second side opposite the first side, a bond-pad on and/or in the first side, and a conductive link extending from the first side to the second side;

the conductive links have a plurality of ends defining the first pads on the second side of the first dies; and

the first conductive mating structures are coupled to the first pads on the second side of the first dies.

[c19] 19. The microfeature workpiece of claim 9 wherein:

the first dies include a third die;

the first pads include a second pad and a third pad adjacent to the second pad on the third die; and

the first conductive mating structures on the second and third pads are spaced apart from each other by a distance of less than approximately 100 microns.

[c20] 20. The microfeature workpiece of claim 9 wherein the first conductive mating structures are formed on corresponding first pads.

[c21] 21. A microelectronic die, comprising an integrated circuit, a plurality of bond-pads electrically coupled to the integrated circuit, and a plurality of first conductive mating structures on corresponding bond-pads, the first conductive mating structures projecting away from the die directly from corresponding bond-pads and being configured to interface with corresponding second conductive mating structures on another microelectronic device to which the die is to be mounted.

[c22] 22. The microelectronic die of claim 21 wherein the first conductive mating structures have generally circular, triangular, or rectangular configurations.

[c23] 23. The microelectronic die of claim 21 wherein the first conductive mating structures include an aperture configured to receive at least a portion of one of the second conductive mating structures.

[c24] 24. The microelectronic die of claim 21 wherein the first conductive mating structures have a male or female configuration.

[c25] 25. A set of stacked microelectronic devices, the set comprising:

a first microelectronic device including an integrated circuit, a plurality of first pads electrically coupled to the integrated circuit, and a plurality of first conductive mating structures at least proximate to corresponding first pads; and

a second microelectronic device including a plurality of second pads and a plurality of second conductive mating structures at least proximate to corresponding second pads, wherein the second conductive mating structures mate with corresponding first conductive mating structures of the first microelectronic device.

[c26] 26. The set of stacked microelectronic devices of claim 25 wherein the first conductive mating structures include an aperture configured to receive at least a portion of the corresponding second conductive mating structure.

[c27] 27. The set of stacked microelectronic devices of claim 25 wherein the first conductive mating structures have a male configuration and the second conductive mating structures have a female configuration.

[c28] 28. The set of stacked microelectronic devices of claim 25 wherein the first conductive mating structures have a generally triangular, circular, or rectangular configuration.

[c29] 29. The set of stacked microelectronic devices of claim 25 wherein:

the first microelectronic device includes a first side and a second side opposite the first side;

the first pads comprise a plurality of first bond-pads on and/or in the first side of the first microelectronic device;

the first conductive mating structures are coupled to corresponding first bond-pads on the first side of the first microelectronic device;

the second microelectronic device includes a first side and a second side opposite the first side;

the second pads comprise a plurality of second bond-pads on and/or in the first side of the second microelectronic device; and

the second conductive mating structures are coupled to corresponding second bond-pads on the first side of the second microelectronic device.

[c30] 30. The set of stacked microelectronic devices of claim 25 wherein:

the first microelectronic device includes a first side, a second side opposite the first side, a first plurality of bond-pads on and/or in the first side, and a plurality of conductive links extending from the first side to the second side;

the conductive links have ends that define the first pads on the second side of the first microelectronic device;

the first conductive mating structures are coupled to corresponding first pads on the second side of the first microelectronic device;

the second microelectronic device includes a first side and a second side opposite the first side;

the second pads comprise a plurality of second bond-pads on and/or in the first side of the second microelectronic device; and

the second conductive mating structures are coupled to corresponding second bond-pads on the first side of the second microelectronic device.

[c31] 31. The set of stacked microelectronic devices of claim 25 wherein the first conductive mating structures are formed on corresponding first pads and the second conductive mating structures are formed on corresponding second pads.

[c32] 32. A set of stacked microelectronic devices, the set comprising:

a first microelectronic device including a first side, a second side opposite the first side, a plurality of bond-pads proximate to the first side, a plurality of conductive links coupled to corresponding bond-pads and extending from the first side to the second side, a plurality of first conductive mating structures aligned with corresponding conductive links on the second side, and a redistribution layer on the first side, the redistribution layer having a plurality of ball-pads electrically coupled to corresponding conductive links and/or bond-pads; and

a second microelectronic device including an integrated circuit, a plurality of first pads coupled to the integrated circuit, and a plurality of second conductive mating structures at least proximate to corresponding first pads, wherein the second conductive mating structures interface with corresponding first conductive mating structures of the first microelectronic device.

[c33] 33. A set of stacked microelectronic devices, the set comprising:

a first microelectronic device including a first side, a second side opposite the first side, a plurality of bond-pads proximate to the first side, a plurality of conductive links coupled to corresponding bond-pads and extending from the first side to at least proximate to the second side, and a plurality of apertures in the second side aligned with corresponding conductive links, wherein the conductive links include an end exposed by the corresponding aperture; and

a second microelectronic device including an integrated circuit, a plurality of first pads coupled to the integrated circuit, and a plurality of conductive mating structures on corresponding first pads, wherein the conductive mating structures are received in corresponding

apertures and positioned at least proximate to the ends of the conductive links of the first microelectronic device.

[c34] 34. A set of stacked microelectronic devices, the set comprising:

a first microelectronic device including a first integrated circuit, a first side, a second side opposite the first side, a plurality of first bond-pads proximate to the first side and electrically coupled to the first integrated circuit, and a plurality of first conductive mating structures at least proximate to corresponding first bond-pads; and

a second microelectronic device including a second integrated circuit, a plurality of second bond-pads proximate to the first side and electrically coupled to the second integrated circuit, and a plurality of second conductive mating structures at least proximate to corresponding second bond-pads, wherein the second conductive mating structures mate with corresponding first conductive mating structures of the first microelectronic device.

[c35] 35. A method of forming a microfeature workpiece, the method comprising:

constructing a plurality of microelectronic dies on a microfeature workpiece, wherein individual microelectronic dies have an integrated circuit and a plurality of bond-pads electrically coupled to the integrated circuit; and

forming a plurality of first conductive mating structures on corresponding bond-pads, the first conductive mating structures projecting away from the workpiece and being configured to mate with a plurality of second conductive mating structures of other microelectronic devices in a stacked die arrangement.

[c36] 36. The method of claim 35 wherein forming the first conductive mating structures comprises forming structures with a generally circular, triangular, or rectangular configuration.

[c37] 37. The method of claim 35 wherein forming the first conductive mating structures comprises:

depositing a seed layer onto the bond-pads; and

plating a conductive material onto the seed layer.

[c38] 38. The method of claim 35 wherein forming the first conductive mating structures comprises forming the first conductive mating structures with solder material.

[c39] 39. The method of claim 35 wherein forming the first conductive mating structures comprises forming the first conductive mating structures such that the first conductive mating structures project away from the bond-pads at an angle generally normal to the microfeature workpiece.

[c40] 40. The method of claim 35 wherein forming the first conductive mating structures comprises forming the first conductive mating structures with a male configuration projecting away from the bond-pads.

[c41] 41. The method of claim 35 wherein forming the first conductive mating structures comprises forming the first conductive mating structures with a female configuration, the first conductive structures having an opening to receive corresponding second conductive mating structures.

[c42] 42. A method of manufacturing stacked microelectronic devices, the method comprising:

constructing a plurality of first microelectronic devices on a first microfeature workpiece, the first microelectronic devices including a microelectronic die with an integrated circuit and a plurality of first pads electrically coupled to the integrated circuit;

forming a plurality of first conductive mating structures on or at least proximate to corresponding first pads;

manufacturing a plurality of second microelectronic devices on a second microfeature workpiece, the second microelectronic devices including a plurality of second pads;

forming a plurality of second conductive mating structures on or at least proximate to corresponding second pads, the second conductive mating structures being configured to mate with corresponding first conductive mating structures; and

positioning at least one of the first microelectronic devices on the second microfeature workpiece so that the first conductive mating structures of the at least one first microelectronic device mate with the second conductive mating structures of the corresponding second microelectronic device.

[c43] 43. The method of claim 42 wherein forming the first conductive mating structures comprises forming the first conductive mating structures with generally circular, triangular, or rectangular configurations.

[c44] 44. The method of claim 42 wherein forming the first conductive mating structures comprises forming the first conductive mating structures with male or female configurations.

[c45] 45. The method of claim 42 wherein forming the first conductive mating structures comprises:

depositing a seed layer onto the first pads; and

plating a conductive material onto the seed layer.

[c46] 46. The method of claim 42, further comprising reflowing the first and second conductive mating structures of the at least one first microelectronic device and the corresponding second microelectronic device to form a plurality of conductive couplers.

[c47] 47. The method of claim 42 wherein:

the first microelectronic devices have a first side and a second side opposite the first side;

the first pads comprise a plurality of bond-pads on the first side of the first microelectronic devices; and

forming the first conductive mating structures comprises forming the first conductive mating structures on the bond-pads on the first side of the first microelectronic devices.

[c48] 48. The method of claim 42 wherein:

the first microelectronic devices include a first side, a second side opposite the first side, a plurality of bond-pads on and/or in the first side, and a plurality of conductive links extending from the first side to the second side;

the conductive links have a plurality of ends defining the first pads on the second side of the first microelectronic devices; and

forming the first conductive mating structures comprises forming the first conductive mating structures on the first pads on the second side of the first microelectronic devices.

[c49] 49. The method of claim 42, further comprising cutting the first microfeature workpiece to singulate the first microelectronic devices before positioning at least one of the first microelectronic devices.

[c50] 50. The method of claim 42 wherein:

forming the first conductive mating structures comprises forming the first conductive mating structures such that the first conductive mating structures project away from the first microfeature workpiece; and

forming the second conductive mating structures comprises forming the second conductive mating structures such that the second conductive mating structures project away from the second microfeature workpiece.

[c51] 51. A method of stacking microelectronic devices, the method comprising:

constructing a first microelectronic device with an integrated circuit and a plurality of first pads electrically coupled to the integrated circuit;

forming a plurality of first conductive mating structures on or at least proximate to corresponding first pads, the first conductive mating structures projecting away from the first microelectronic device;

providing a second microelectronic device with a plurality of second pads;

forming a plurality of second conductive mating structures on or at least proximate to corresponding second pads, the second conductive mating structures projecting away from the second microelectronic device and being configured to mate with the first conductive mating structures; and

aligning the first and second microelectronic devices by interfacing the first and second conductive mating structures.

[c52] 52. The method of claim 51 wherein forming the first conductive mating structures comprises forming the first conductive mating structures with a generally circular, triangular, or rectangular configuration.

[c53] 53. The method of claim 51 wherein forming the first conductive mating structures comprises forming the first conductive mating structures with a male or female configuration.

[c54] 54. The method of claim 51 wherein forming the first conductive mating structures comprises:

depositing a seed layer onto the first pads; and

plating a conductive material onto the seed layer.

[c55] 55. The method of claim 51, further comprising reflowing the first and second conductive mating structures to form a plurality of conductive couplers.

[c56] 56. A method for coupling a first microelectronic device with a plurality of first pads to a second microelectronic device with a plurality of second pads, the method comprising:

forming a plurality of first conductive complementary structures on or at least proximate to corresponding first pads of the first microelectronic device, the first conductive complementary structures projecting away from the first microelectronic device;

forming a plurality of second conductive complementary structures on or at least proximate to corresponding second pads of the second microelectronic device, the second conductive complementary structures projecting away from the second microelectronic device and being configured to mate with the first conductive complementary structures;

mating the first conductive complementary structures with the second conductive complementary structures; and

reflowing the first and second conductive complementary structures to form a plurality of conductive couplers between corresponding first and second pads.

[c57] 57. The method of claim 56 wherein forming the first conductive complementary structures comprises forming the first conductive complementary structures with a generally circular, triangular, or rectangular configuration.

[c58] 58. The method of claim 56 wherein forming the first conductive complementary structures comprises forming the first conductive complementary structures with a male or female configuration.

[c59] 59. The method of claim 56 wherein forming the first conductive complementary structures comprises:

depositing a seed layer onto the first pads; and

plating a conductive material onto the seed layer.